REMARKS

Reconsideration and allowance are respectfully requested.

Claims 1-2 and 5-16 are pending in the application.

Claims 1-2, 6-9, 11-15 stand rejected under 35 USC § 103(a) as being unpatentable over AAPA in view of Johnson.

Applicant respectfully traverses this rejection.

The Examiner once again turns to the present specification as teaching the welding of a combustion chamber from different components of highly temperature resistant nickel based casting alloy. Respectfully, this reliance on the background specification is misplaced. In taking this position, the Examiner ignores 1) the fact that the background section teaches that previous attempts at welding combustion chambers of highly temperature resistant nickel based casting alloy resulted in a combustion chamber of inferior strength and 2) the prior art reference EP '704 cited and discussed in the background section that specifically teaches away from welding combustion chambers of highly temperature resistant nickel based casting alloy.

No person of ordinary skill in the art could possibly read the background discussion in the present specification as standing for anything but, that before the present invention, parts of a highly temperature resistant nickel based casting alloy could not be welded together to form a combustion chamber for a gas turbine engine without the strength of the combustion chamber being compromised. The specification clearly states that the previous attempts at welding components of a highly temperature resistant nickel based casting alloy resulted in combustion chambers of inferior strength because "the thermal strength of [the] weld joint is inferior to that of the casting". Such an embodiment would be clearly recognized by a person of ordinary skill in the art as being unacceptable for use in life-critical situations, such as for combustion chambers of gas turbines typically used in aircraft where the failure of the combustion chamber could directly result in death or serious injury to multiple passengers on the aircraft.

In complete support of this position as to how a person of ordinary skill in the art would read the background section is specification EP '704, disclosed and discussed in the present specification at page 1, first paragraph through page 2, second paragraph. It teaches the use of

a nickel-based alloy in the manufacture of a combustion chamber, and is very explicit in stating that a combustion chamber of a nickel based alloy should be cast and not welded because the welding decreases the strength of the combustion chamber. See, page 3, lines 27-30:

> Further, in order to prevent the strength of welding portions from lowering, it is necessary to make a cylindrical member without welding. In order to solve this, the cylindrical member is manufactured by centrifugal casting or lost wax precision casting. By casting it, the cylindrical member which has no large grain size and no welding portion can be attained. (emphasis added)

See also, page 4, lines 37-44:

> In the present invention, a combustor cylindrical liner and a transition piece are made of Fe base alloy, Ni base alloy or Co base alloy. By forming them by casting, high strength is attained, further, since the cylindrical liner body has no welding portion, a strength decrease at the welding portion can be prevented. Since in the gas turbine combustor, the combustion gas temperature has been raised, exceeding 1300° C, and becoming 1400° C, further 1500° C, the combustor itself has been raised in temperature according to the elevation of the combustion gas temperature. Therefore, material of higher strength at a higher temperature is desired, the material is possible to provide a structure having no welding portion in the barrel portion . . . (emphasis added)

As is apparent from the discussion above, the AAPA (including EP '704) specifically discloses that welding the combustion chamber of highly-temperature resistant nickel-based alloy will reduce its strength. Thus, the AAPA teaches away from the welding of a nickel-based alloy combustion chamber and is in direct conflict with the Examiner's rejection.

To further clarify this distinction between the claimed invention and the AAPA, claim 1 has been amended to require that the welded joints have a thermo-mechanical strength substantially the same as the individual wall sections. This is nowhere disclosed or suggested in the prior art and, in fact, is in direct conflict with the AAPA. For this reason, any rejection relying on the AAPA should be withdrawn.

This deficiency is not cured by Johnson, which discloses the laser welding of spark plugs. While such spark plugs are exposed to high temperatures, they are not required to endure high mechanical stress. Significantly, these spark plugs are relatively small in size and the welded components of the spark plugs are even smaller. These small components do not encounter the residual stresses that occur in welding large components such as the combustion chamber components of the claimed invention. The bigger the components welded, the greater the residual stresses that occur under conventional welding. The residual stresses that occur under conventional welding of large components, such as the combustion chamber components of the present invention, weaken the welded assembly and can result in catastrophic failure of the combustion chamber.

The claimed method provides a welding method whereby such large components can be welded together without creating the residual stresses found in a conventionally welded combustion chamber, and this results in a stronger, more reliable combustion chamber having a significantly less chance of failure. Therefore, the welding of the small components of a spark plug is simply incomparable to the welding of the large parts of a gas-turbine engine combustion chamber and the mechanical failure of such a spark plug, while undesirable, is substantially less significant than the mechanical failure of a combustion chamber of a gas turbine typically used in an aircraft.

Further, nowhere does Johnson teach or discuss laser welding together a plurality of individual wall sections of a highly-temperature resistant nickel-based casting alloy. Johnson only teaches the laser welding of a precious metal alloy insert (of platinum, platinum and iridium alloy or other alloy of platinum, or palladium, iridium or an alloy thereof) to a ground electrode 12B or a center electrode 18B of a nickel alloy. See Johnson, col. 5, line 51 through col. 6, line 14. Johnson also teaches the welding of the ground electrode of a nickel alloy to the spark plug skirt 26 of metal shell 20 of conventional structure. See Johnson, col. 5, lines 41-45, col.3, line 66 through col. 4, line 2 and col. 4, lines 42-50. Nowhere does Johnson teach or suggest that one component of highly-temperature resistant nickel-based casting alloy be laser welded to another component of highly-temperature resistant nickel-based casting alloy.

Furthermore, as discussed above, neither the precious metal inserts welded to the ground electrode 12B or the center electrode 18B, nor the ground electrode 12B welded to the metal shell 20, encounter the extreme mechanical stresses that are encountered by the combustion chamber wall sections and the joints therebetween of the invention of claim 1.

Finally, nowhere does Johnson disclose or suggest a combustion chamber formed from a plurality of laser welded wall sections of a highly-temperature resistant nickel-based casting alloy where the welded joints have a thermo-mechanical strength substantially the same as the individual wall sections, as is required in amended claim 1

Therefore, a person of ordinary skill in the art would not turn to Johnson to cure the deficiencies disclosed in the AAPA, and even if he or she did,

A person of ordinary skill in the art presented with the AAPA and Johnson not only wouldn't find claim 1 obvious, he/she would be taught that such a method should not be done.

It is impermissible for the Examiner to ignore the teachings of the AAPA, and the deficiencies of Johnson, to find motivation to combine the two in rejecting claim 1. Such motivation to combine cannot come from the present disclosure of Applicant's own invention, used as a roadmap to create a hindsight combination of prior art references.

In view of the above, it is respectfully requested that this rejection be withdrawn.

Claims 2 and 5-16 all ultimately depend from claim 1 and are allowable for the reasons given above with respect to claim 1 and for the further limitations contained therein.

Claims 5, 10 and 16 stand rejected under 35 USC § 103(a) as being unpatentable over AAPA in view of Johnson and further in view of Gasse.

Applicant respectfully traverses this rejection.

The Examiner states that Gasse teaches "that it is old and well known to use conventional laser welding with or without filler material." Actually, all the Gasse says about this subject is: " Also, conventional joining techniques by welding using a power beam with or without filler material (tungsten inert gas welding (TIG), electron or laser welding) implying partial fusion of the parts to be joined cannot be used for joining ceramics since it is not possible to melt a ceramic part...". Gasse then goes on to teach a brazing method for silicon

carbide (ceramic) parts. Gasse is completely irrelevant to welding components of a highly-temperature resistant nickel-based metal casting alloy. Further, the statement noted above about not using a filler material is given without further detail and is nowhere in Gasse connected in any way with the welding of components of a highly-temperature resistant nickel-based casting alloy. A person of ordinary skill in the art fully aware of the problems of joining components of a highly-temperature resistant nickel-based casting alloy would not look at Gasse to solve such problems because Gasse has nothing whatsoever to do or say about joining such nickel-based casting alloys either in discussing the prior art or teaching his invention. Applicant believes that in light of the irrelevancy of Gasse to the claimed invention, as discussed above, the combination of Gasse with Johnson and or the AAPA is an improper combination that a person of ordinary skill in the art would not make. The mere mention in the background section of welding without a filler using a laser, and nothing more, in a specification teaching an invention for brazing ceramic components, does not make Gasse relevant to the claimed invention.

Even though Gasse says or implies nothing about joining highly-temperature resistant nickel-based casting alloys, as discussed previously, welding the individual wall sections without filler material is an important aspect of the claimed invention. By laser welding the individual wall sections without filler material, the inferior thermal strength of the filler material cannot jeopardize the strength of the weld. This results in a stronger weld and a stronger combustion chamber. Since Gasse has nothing to say about joining highly-temperature resistant nickel-based casting alloys, Gasse fails to even recognize the problems that are incurred in welding such highly temperature resistant alloys and certainly fails to disclose or suggest the method claimed in claims 5, 10 and 16, even if it could be properly combined with Johnson and the AAPA, which Applicant submits it cannot for purposes of claims 5, 10 and 16. None of the prior art discloses or suggests the method of claims 5, 10 and 16 and it is respectfully requested that claims 5, 10 and 16 be indicated as containing allowable material.

Claims 6 and 11 are also allowable for these further reasons. The Examiner states that the "AAPA as modified by Johnson (emphasis on Johnson) further discloses whether the laser welding inputs low or high energy to the wall sections." The Johnson disclosure has been very carefully reviewed and the undersigned can find no reference to the use of low energy being

used to laser weld the spark plug components of Johnson. If the Examiner can specifically point out where Johnson teaches or suggests the method of claims 6 and 11, he should do so, specifically identifying the column and lines where such teaching/suggestion is. If the Examiner cannot specifically identify where Johnson provides such teaching/ suggestion, then the undersigned submits that Johnson does not teach or suggest the invention claimed in claims 6 and 11 and the rejection of such claims should be withdrawn. As previously discussed, and specifically stated at page 3, first paragraph of the specification, "if the casting material is a highly temperature-resistant nickel-base casting alloy, the low energy input of the laser welding process will enable a crack-free joint to be made between the wall sections in the nickel-base casting materials." Thus, this is not merely a matter of design choice; it is the low energy input of the laser welding process that enables a crack-free joint. A high energy input can create cracks in the weld joint of the highly temperature-resistant nickel-base casting materials, thereby weakening the joint and compromising the strength of the combustion chamber.

None of the prior art discloses or suggests the method of claims 6 and 11 and it is respectfully requested that claims 6 and 11 be indicated as containing allowable material.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance, and such a Notice is earnestly solicited. If any points remain in issue, the Examiner is requested to telephone the undersigned at the number below.

Respectfully submitted,

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